WHAT IS CLAIMED IS:

1. A method for measuring the aberration refraction of the components of the eye, said method comprising:
   a) measuring the total aberration refractive characteristics of said eye;
   b) measuring the corneal shape of said eye and therefore its refractive power;
   c) calculating the aberrations of said cornea from the refractive power;
   d) calculating the difference between the values of said total aberration refractive characteristics of the total eye and the cornea;
   e) storing refractive characteristics measured and calculated by **1**(a), **1**(b), **1**(c) and **1**(d) hereof;
   f) transforming the refractive characteristics of said components into continuous three-dimensional distributions of said characteristics; and
   g) displaying said three dimensional distributions of said refractive characteristics.

2. The method recited in claim **1** wherein the steps of measuring the total aberration refraction of said eye **1**(a) and measuring the corneal shape of said eye and its associated refractive power **1**(b) are measured either synchronously or sequentially.

3. The method recited in claim **1** wherein the step of measuring the total aberration refraction of said eye comprise the steps of:
   a) using ray tracing to determine the refractive characteristics of each eye at a plurality of spatially resolved locations on the eye; and
   b) calculating from the plurality of refractive characteristics at the plurality of spatially resolved locations an estimated expression of the refraction characteristics base upon best fit by a curve fitting algorithm.

4. The method of claim **3** wherein the curve-fitting algorithm comprises a Zernike polynomial expansion.

5. The method of claim **3** wherein the curve-fitting algorithm comprises a polynomial expansion series.

6. The method of claim **3** wherein the curve-fitting algorithm comprises spline mathematical calculations.

7. The method of claim **1** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:
   a) using Hartman –Shack wavefront sensing to determine the refractive characteristics of each eye; and
   b) calculating from the Hartmann-Shack wavefront analysis an expression of refraction based upon best fit to a curve fitting mathematical function.

8. The method of claim **1** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:
   a) using an aberroscope to determine distortion in a grid projected on the eye to indicate the refractive characteristics of said eye; and
   b) calculating from the aberroscope grid distortions an estimated expression of refraction based upon best fit to a mathematical function.

9. The method of claim **1** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:
   a) using a device based upon the Foucault's knife method [5] to measure the refractive characteristics of said eye; and
   b) calculating from sciascopy measurement an estimated expression of refraction based upon best fit to a mathematical function.

10. The method of claim **1** wherein the step of measuring the corneal shape of said eye and its associated refractive power comprises the step of;

a) projecting a regular structure or regular patterns, such as a pattern of concentric rings onto the cornea; and
b) analyzing the reflected light and reconstruction from the analyzed data the shape and therefore the refraction distribution caused by the cornea; and
c) analyzing said refractive power by means of a best-fit mathematical function to calculate the aberrations of said cornea.

11. The method of claim **10** wherein said regular pattern consist of alternating light and dark spots on said concentric rings (checkerboard pattern).

12. The method of claim **1** wherein the step of measuring the corneal shape of said eye and its associated refractive power comprises the steps of:

a) using a laser ray tracing technique wherein a plurality of sequential thin beams impinge the cornea of the eye at a plurality of locations causing a portion of the beam to be reflected from the corneal surface; and
b) using a position-sensitive detector to determine angle of the reflected beams;
c) performing calculations to determine the corneal shape and refractive power; and
d) performing calculations to determine the aberrations of the corneal surface.

13. The method of claim **12** wherein the said plurality of thin ray tracing beams are polarized.

14. The method of claim **12** wherein the said plurality of thin ray tracing beams are non-polarized.

15. The method of claim **1** wherein the step of measuring the total eye aberration refraction comprises making the measurements at continuously varying states of patient accommodation.

16. The method of claim **1** wherein the step of measuring the total eye aberration refraction comprises making the measurements at fixed intervals of accommodation.

17. The method of claim **1** wherein the step of measuring the total eye aberration refraction comprises making the measurements under continuously varying lighting conditions from scotopic to photopic.

18. The method of claim **1** wherein the step of measuring the total eye aberration refraction comprises making the measurements at fixed intervals of light illumination to simulate scotopic, mesoptic and photopic conditions.

19. The method of claim **3** wherein the thin beams for the ray tracing method of determining the total aberration refraction of the eye comprises the steps;

a) plurality of thin beams impinge upon the corneal surface parallel to each other (far point light source); and
b) plurality of thin beams impinge upon the corneal surface non-parallel to each other (near point light source.

20. A method as in claim 1 whereby analysis of the aberration refractive characteristics of the components of the eye determined in **1**(d) is used to improve the outcome of corneal refractive surgery by the steps of;

a) if the major portion of astigmatic and/or higher order aberrations of the total eye are on the corneal surface, then recomending refractive surgery; and
b) if a significant fraction of astigmatic and/or higher order aberrations of the total eye are on the internal optics (non-corneal), then not recommending refractive surgery.

21. A method as in claim 1 whereby analysis of the aberration refractive characteristics of the components of the eye determined in **1**(d) is used to improve the outcome of intraocular lens replacement surgery by the steps of:

a) if the major portion of astigmatic and/or higher order aberrations of the total eye are on the corneal surface, then recommending surgery to replace the intraocular lens with a standard IOL; and

b) if a significant fraction of astigmatic and/or higher order aberrations of the total eye are on the internal optics (non-corneal), then not recommending the surgery to replace the intraocular lens with a standard IOL.

22. A method as in claim 19 further comprising formulating new algorithms for refractive surgery by analysis of the aberration refractive characteristics of the components of the eye determined in **1**(d) to obtain optimized correction based on boundaries of visual function for near and far point data.

23. A method as in claim 16 further comprising formulating new algorithms for refractive surgery by analysis of the aberration refractive characteristics of the components of the eye determined in **1**(d) to obtain optimized correction based on an analysis of various states of eye accommodation.

24. A method as in claim 18 further comprising formulating new algorithms for refractive surgery by analysis of the aberration refractive characteristics of the components of the eye determined in **1**(d) to obtain optimized correction based on an analysis of various states of pupil constriction.

25. A method of claim 1 further comprising analyzing the aberration refractive characteristics of the components of the eye determined in **1**(d) and manufacturing a custom intraocular lens that corrects existing aberrations of the internal optics of an eye.

26. An instrument for measuring the aberration refraction of the components of the eye, said instrument comprising:

a) means for measuring the total aberration refractive characteristics of said eye; and

b) means for measuring the corneal shape of said eye and therefore its refractive power; and

c) means for calculating the aberrations of said cornea from the refractive power; and

d) means for calculating the difference between the values of said total aberration refractive characteristics of the total eye and the cornea; and

e) means for storing refractive characteristics calculated by means of **26**(a), **26**(b), **26**(c) and **26**(d); and

f) means for transforming the refractive characteristics of said components into continuous three-dimensional distributions of said characteristics; and

g) means for displaying said three dimensional distributions of said refractive characteristics.

27. The instrument recited in claim **26** wherein the means for measuring the total aberration refraction of said eye **26**(a) and the means for measuring the corneal shape of said eye and its associated refractive power **26**(b) are coupled for either synchronously measuring the shapes or sequentially measuring the shapes.

28. The instrument of claim **26** wherein the means for measuring the total aberration refraction of said eye comprise:

a) a ray tracing device used to determine the refractive characteristics of each eye at a plurality of spatially resolved locations on the eye; and

b) a means for calculating from the plurality of refractive characteristics at the plurality of points an estimated expression of the refraction characteristics base upon best fit by a curve fitting algorithm.

29. The instrument of claim **28** wherein the curve-fitting algorithm comprises a Zernike polynomial expansion.

30. The instrument of claim **28** wherein the curve-fitting algorithm comprises a polynomial expansion series.

31. The instrument of claim **28** wherein the curve-fitting algorithm comprises spline mathematical calculations.

32. The instrument of claim **26** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:

a) using Hartman –Shack wavefront sensing to determine the refractive characteristics of each eye; and

b) calculating from the Hartmann-Shack wavefront analysis an expression of refraction based upon best fit to a curve fitting mathematical function.

33. The instrument of claim **26** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:

a) using an aberroscope to determine distortion in a grid projected on the eye to indicate the refractive characteristics of said eye; and

b) calculating from the aberroscope grid distortions an estimated expression of refraction based upon best fit to a mathematical function.

34. The instrument of claim **26** wherein the step of measuring the total aberration refraction of said eye comprises the steps of:

a) using a device based upon the Foucault's knife method [5] to measure the refractive characteristics of said eye; and

b) calculating from sciascopy measurement an estimated expression of refraction based upon best fit to a mathematical function.

35. The instrument of claim **26** wherein the step of measuring the corneal shape of said eye and its associated refractive power comprises the step of;

a) projecting a regular structure or regular patterns, such as a pattern of concentric rings onto the cornea; and
b) analyzing the reflected light and reconstruction from the analyzed data the shape and therefore the refraction distribution caused by the cornea; and
c) analyzing said refractive power by means of a best-fit mathematical function to calculate the aberrations of said cornea.

36. The instrument of claim **33** wherein said regular pattern consist of alternating light and dark spots on said concentric rings (checkerboard pattern).

37. The instrument of claim **26** wherein the step of measuring the corneal shape of said eye and its associated refractive power comprises the steps of:

a) a laser ray tracing technique wherein a plurality of sequential thin beams impinge the cornea of the eye at a plurality of locations causing a portion of the beam to be reflected from the corneal surface; and
b) a position-sensitive detector determines to angle of the reflected beams; and
c) calculations are preformed to determine the corneal shape and refractive power; and
d) calculations are preformed to determine the aberrations of the corneal surface.

38. The instrument of claim **37** wherein the said plurality of thin ray tracing beams are polarized.

39. The instrument of claim **37** wherein the said plurality of thin ray tracing beams are non-polarized.

40. The instrument of claim **28** wherein the said ray tracing uses polarized light beams.

41. The instrument of claim **28** wherein the said ray tracing uses non-polarized light beams.

42. The instrument of claim **26** further comprising means for measuring the total eye aberration refraction at continuously varying states of patient accommodation.

43. The instrument of claim **26** further comprising means for measuring the total eye aberration refraction at fixed intervals of accommodation.

44. The instrument of claim **26** further comprising means for measuring the total eye aberration refraction comprises making the measurements under continuously varying lighting conditions from scotopic to photopic.

45. The instrument of claim **26** further comprising means for measuring the total eye aberration refraction comprises making the measurements at fixed intervals of light illumination to simulate scotopic, mesoptic and photopic conditions.

46. The instrument of claim **26** wherein the thin beams for the ray tracing to determine the total aberration refraction of the eye comprises a plurality of thin beams that impinge upon the corneal surface parallel to each other (far point light source); and a plurality of thin beams that impinge upon the corneal surface non-parallel to each other (near point light source).